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ABSTRACT

Designed to improve students' thinking, learning, and creative skills while they learn to program a microcomputer in BASIC programing language, this book for intermediate learners at the high school/adult level provides a variety of microcomputer activities designed to extend the concepts taught in the accompanying instructional manuals (Volumes 3 and 4). These activities require students to apply those concepts to challenging problems which need original and creative solutions. Each activity includes introductory information; a program to enter, run, and observe; and challenges to change or use the program. Programs involve creating random numbers; using RND to represent a rolled die; using arrays to store random numbers and to store words which may then be selected randomly; calculating compound and simple interest; calculating a realtor's commission; solving equations for speed and distance; creating a quiz; displaying the alphabet; and creating words composed of randomly selected letters and storing them in an array. (Author/LMM)

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MICROCOMPUTER PROJECTS

for Growing Minds

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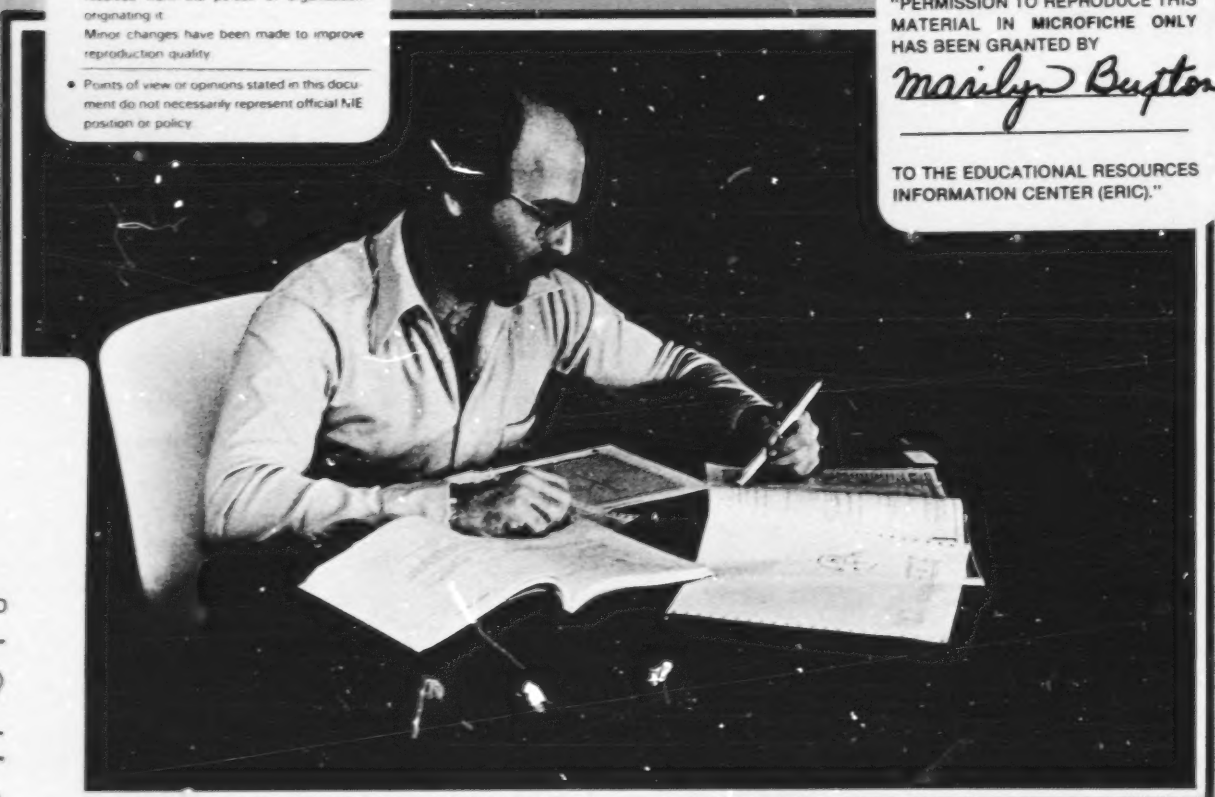

IR011318

Adult Intermediate Microcomputer Projects

THINKING · LEARNING · CREATING

TLC

MICROCOMPUTER PROJECTS

for Growing Minds

Adult Intermediate Microcomputer Projects

by Henry A. Taitt

tion Resources

CREATIVE LEARNING ASSOCIATION, INC.
RR#4, Box 330
Charleston, Illinois 61920

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These projects may be worked on any brand of computer. However, you will sometimes need to make small changes in the commands that are printed in order to get the program to run. A hint is often given the first few times this is necessary.

Do not hesitate to try variations of your own.

Some computers allow messages with INPUT statements. Others do not. Some automatically add a question mark. Some allow only a limited message (for example, VIC-20) in what can be done after the THEN.

IF-THEN commands vary considerably. RND is also quite different on different computers.

In some cases, commands will be included that are necessary with some computers, but are not needed with your computer. Leave them out if your computer doesn't need them. (For example, DIM A(5) for computers other than Atari.)

The challenge will always be yours to get the program to RUN. Accept this challenge, and you will become an excellent programmer.

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INFORMATION

Creating random numbers is done differently by different computers. Each thing that is suggested here will work on some microcomputer. See which ones will work on your computer.

ENTER/RUN/OBSERVE

This should produce five different random numbers.

```
10 FOR X=1 TO 5
20 PRINT RND(0)
30 NEXT X
```

RUN each program twice to see if the RUNs are different.

CHANGE IT/RUN/OBSERVE

Try each of these changes.

```
20 PRINT RND
```

```
20 PRINT RND(1)
```

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CHANGE IT/RUN/OBSERVE

Some computers require an additional command to insure each RUN is different. Try these.

```
5 RANDOM
```

Now this.

```
5 RANDOMIZE
```

One microcomputer even requires this.

```
5 RANDOMIZE(VAL(RIGHT$(TIME$,2)))
```

CHALLENGE

Find the method for <u>your</u> <u>computer</u> that will produce five different numbers all less than one.

Whenever a project requires random numbers, you may need to alter the commands for your computer.

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INFORMATION

To create random numbers between 6 and Ø, many computers require multiplying.

ENTER/RUN/OBSERVE

```
10 FOR X=1 TO 5
20 PRINT 7*RND(Ø)
30 NEXT X
```

CHANGE IT/RUN/OBSERVE

Some will accept this.

```
20 PRINT RND(6)
```

CHALLENGE

Create a program that will produce ten random whole numbers between 1 and 12.

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INFORMATION

Rolling a die is considered a random event. The RND command can be used to represent a rolled die.

ENTER/RUN/OBSERVE

Make the necessary changes in line 11Ø for your computer.

```
100 REM *** RANDOMLY SELECT ***
110 N=INT(6*RND(0)+1)
130 PRINT N
150 GOTO 110
```

CHANGE IT/RUN/OBSERVE

To make it two dice:

```
100 REM *** FIRST DIE ***
110 N=INT(6*RND(0)+1)
115 REM *** SECOND DIE ***
120 M=INT(6*RND(0)+1)
130 PRINT N,M
```

Make any additions or changes necessary for your computer.

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CHANGE IT/RUN/OBSERVE

And the sum of two dice:

```
125 REM *** SUM OF TWO DICE ***
130 S=N+M
140 PRINT N,M,S
150 GOTO 100
```

SAVE this program. Name it DICE.

CHALLENGE

Create a program that will produce a table showing ten rolls of two dice. Show the results of each die and their sum.

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INFORMATION

Arrays may be used to store random numbers.

ENTER/RUN/OBSERVE

```
10 FOR T=1 TO 10
20 A(T)=INT(10*RND(0))
30 NEXT T
```

Atari add
5 DIM A(10)

The numbers have been stored.

CHANGE IT/RUN/OBSERVE

To get them printed, add these lines.

```
40 FOR X=1 TO 10
50 PRINT "#";X,A(X)
60 NEXT X
```

If you wish the array to contain 21 locations,

try this.

```
 5 DIM A(20)
10 FOR T=0 TO 20
40 FOR X=0 TO 20
```

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CHALLENGE

Create a program that will store and display 100 random integers between 0 and 100.

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ENTER/RUN/OBSERVE

Load the DICE program. To find out how many times each number appears in 100 rolls for each die, add these lines.

```
 90 FOR T=1 TO 100
112 F(N)=F(N)+1
122 S(M)=S(M)+1
150 NEXT T
155 REM *** FREQUENCY TABLE ***
160 FOR R=1 TO 6
170 PRINT "#";R, F(R),S(R)
180 NEXT R
```

LIST. Study the program carefully. RUN and wait! Notice how lines 112 and 122 keep a count of how often each number is selected.

CHALLENGE

Change the program to represent one thousand rolls. Remove the REM statements and line 140 to speed up the counting.

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ENTER/RUN/OBSERVE

```
10 PRINT "TEN DOLLARS DIVIDED BY 3=";10/3
20 A=100*(10/3)
30 B=INT(A)
40 C=B/100
50 PRINT "TEN DOLLARS DIVIDED BY 3=";C
```

CHANGE IT/RUN/OBSERVE

```
20
30
40 C=INT(100*(10/3))/100
```

CHANGE IT/RUN/OBSERVE

Change the program to represent twenty dollars divided by three.

CHALLENGE

Create a program that will randomly select a number of dollars less than $100.00, and only print those that can be divided evenly into two parts.

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ENTER/RUN/OBSERVE

RUN this program.

```
10 PRINT "HOW MANY HOURS"
20 PRINT "HAVE YOU WORKED"
30 PRINT "THIS WEEK?"
40 INPUT N
50 PRINT "HOW MUCH DO YOU"
60 PRINT "GET PAID PER HOUR?"
70 INPUT R
80 PRINT "YOUR GROSS PAY IS $";N*R;"."
```

CHANGE IT/RUN/OBSERVE

Notice that line 70 requires a number without a dollar sign. Add a message requesting only a number be given for R.

CHALLENGE

Alter the above program to allow for time and a half for over forty hours.

INFORMATION

Arrays may be used to store words which may then be selected randomly.

ENTER/RUN/OBSERVE

(If you have an Atari, skip this project.)

```
30 REM *** FILL THE ARRAY ***
40 FOR T=0 TO 9
45 PRINT "ENTER A NAME."
50 INPUT N$
60 A$(T)=N$
70 NEXT T
90 REM *** RANDOMLY SELECT A NAME ***
100 X=INT(10*RND(0))
110 PRINT X,A$(X)
120 GOTO 100
```

In line 100, use the form of RND that works for your computer.

CHANGE IT/RUN/OBSERVE

If you wish to increase the size of the array, add these lines.

```
20 DIM A$(20)
40 FOR T=0 TO 20
```

CHALLENGE

Create a program that will store the letters of the alphabet in an array and will randomly select them for display.

SUPER CHALLENGE

Have your program select them in groups of five to form five letter words.

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INFORMATION

Two hundred dollars invested at 6% for one year earns twelve dollars interest.

$$\text{INTEREST} = \frac{\text{RATE x PRINCIPAL x TIME}}{100}$$

or

$$I = \frac{R \times P \times T}{100}$$

in this case

$$12 = \frac{6 \times 200 \times 1}{100}$$

This is called SIMPLE INTEREST.

ENTER/RUN/OBSERVE

```
 40 PRINT "INPUT THE PRINCIPAL."
 50 INPUT P
 60 PRINT "INPUT THE RATE."
 70 INPUT R
 80 PRINT "INPUT THE NUMBER OF YEARS."
 90 INPUT T
100 PRINT "DOLLARS","INTEREST"
110 PRINT "INVESTED","EARNED"
200 I=R*P*T/100
210 PRINT P,I
300 GOTO 40
```

RUN. Try several different values.

CHANGE IT/RUN/OBSERVE

Make this change.

```
21Ø PRINT "$"; P,"$";I
```

CHANGE IT/RUN/OBSERVE

Most computers will also accept this change.

```
4Ø PRINT
5Ø INPUT "INPUT THE PRINCIPAL";P
```

For the TI-99/4A, replace the ; with a :

Make a similar change for the other two

INPUTs, if your computer can do this.
(VIC-20 allows a limited message.)

CHANGE IT/RUN/OBSERVE

Now add these lines.

```
3Ø REM *** INPUT THE VALUES ***
95 REM *** CREATE THE TITLES ***
19Ø REM *** CALCULATE THE INTEREST ***
2Ø5 REM *** PRINT OUT THE RESULTS ***
29Ø REM *** GO BACK TO THE START ***
```

REM statements are the sign of a pro!

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CHANGE IT/RUN/OBSERVE

Make this change in line 200.

```
*********************************************
*200 I=(R*P*T)/100                          *
*                                           *
*********************************************
```

CHALLENGE

Create a program that will calculate the SIMPLE INTEREST for $1000 invested for 10 years where the rate of interest starts at 5% and increases by 0.5% each of the following years. Have your results displayed for each of the ten years.

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INFORMATION

If interest is paid at the end of the year and added to the principal, then the next year interest will be earned on both the original principal and the previous interest. This is often called COMPOUND INTEREST.

ENTER/RUN/OBSERVE

```
 30 REM *** INPUT THE VALUES ***
 40 INPUT "WHAT IS THE PRINCIPAL?";P
 50 INPUT "WHAT IS THE RATE?";R
 60 INPUT "FOR HOW MANY YEARS?";T
 95 REM *** CREATE THE TITLES ***
100 PRINT "NUMBER","INTEREST","NEW"
110 PRINT "OF YEARS","EARNED","BALANCE"
180 FOR Y=1 TO T
190 REM *** CALCULATE THE INTEREST ***
200 I=R*P*1/100
202 REM *** CALCULATE THE NEW PRINCIPAL
***
204 P=P+I
205 REM *** PRINT OUT THE RESULTS ***
210 PRINT Y,"$";I,"$";P
280 NEXT Y
(program continued)
```

```
290 REM *** GO BACK TO THE START ***
300 GOTO 40
```

RUN.

If your computer does not allow INPUT statements like those in lines 40, 50 and 60, change it so it will RUN on your computer.

SAVE this program. Name it COMPOUND INTEREST or CI.

CHALLENGE

Change the above program to add a column of SIMPLE INTEREST for each year.

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INFORMATION

If the interest is compounded each month, the balance increases even faster.

ENTER/RUN/OBSERVE

Load COMPOUND INTEREST and make these changes using your EDITing skills.

```
110 PRINT "OF MONTHS","EARNED","BALANCE"
180 FOR Y=1 TO 12*T
190 REM *** CALCULATE THE MONTHLY INTEREST
***
200 I=(R*P*1)/(100*12)
```

If you have a printer available, print out the results.

CHALLENGE

Change the program to allow for the interest to be compounded daily.

SUPER CHALLENGE

Change the program from the above CHALLENGE so that the daily interest is calculated as simple interest, but the earned interest is only added to the balance monthly.

INFORMATION

When a realtor sells your house for you, they usually charge 7% of the sale price.

CHALLENGE

Create a program that will allow you to INPUT the ASKING PRICE. Have the program calculate and display the REALTOR'S COMMISSION and the VALUE you receive. Your display should look something like this.

ASKING PRICE	REALTOR'S COMMISSION	VALUE RECEIVED
$40,000	$2,800	$37,200

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INFORMATION

The IF-THEN statement is handled differently on different microcomputers.

ENTER/RUN/OBSERVE

Try this. Remove any lines that give error messages.

```
 10 A=2
 20 IF A=2 THEN GOTO 100
 30 IF A=2 THEN 200
 40 IF A=2 GOTO 300
 50 END
100 PRINT "LINE 20 WORKED!"
150 GOTO 30
200 PRINT "LINE 30 WORKED!"
250 GOTO 40
300 PRINT "LINE 40 WORKED!"
```

Remember which forms your computer will accept.

INFORMATION

IF X/N=INT(X/N) THEN N can be divided into X an even number of times. It is also correct to say that X is a multiple of N.

ENTER/RUN/OBSERVE

```
20 PRINT "ENTER A NUMBER"
30 INPUT N
40 IF N/3=INT(N/3) GOTO 80
50 PRINT N;" IS NOT A MULTIPLE OF 3."
60 GOTO 20
80 PRINT N;" IS A MULTIPLE OF 3."
90 GOTO 20
```

Line 40 may need a THEN added.

CHANGE IT/RUN/OBSERVE

Change the program to select multiples of 7.

CHANGE IT/RUN/OBSERVE

Now add these lines. Include a THEN if needed.

```
25 T=T+1
```

(program continued)

```
* 26 IF T=5 GOTO 1ØØ                    *
*                                       *
*1ØØ END                                *
*                                       *
*****************************************
```

CHANGE IT/RUN/OBSERVE

Change lines 2Ø and 3Ø so a number between 1 and 1ØØ is randomly selected.

CHALLENGE

Create a program that will randomly select numbers between 1 and 5Ø, and will place even numbers in a different column from odd numbers.

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ENTER/RUN/OBSERVE

```
20 PRINT "ENTER A NUMBER."
30 INPUT N
40 IF N/2=INT(N/2) GOTO 70
50 PRINT ,N
60 GOTO 20
70 PRINT N
80 GOTO 20
```

This program places even numbers in one column and odd numbers in a second column as they are entered.

CHANGE IT/RUN/OBSERVE

Add these lines and it will store them in an array as they are entered.

```
10 FOR T=1 TO 10
50 O(T)=N
60 GOTO 80
70 E(T)=N
80 NEXT T
```

For Atari, add:

```
 5 DIM O(10)
 6 DIM E(10)
```

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CHANGE IT/RUN/OBSERVE

And this will display them on the screen,

but with many extra zeros.

```
100 PRINT "ODD","EVEN"
110 FOR T=1 TO 10
120 PRINT O(T),E(T)
130 NEXT T
```

CHANGE IT/RUN/OBSERVE

You may need to add THEN with the IF statements.

Add this to get rid of the zeros.

```
115 IF O(T)=0 GOTO 119
117 PRINT O(T)
119 IF E(T)=0 GOTO 130
120 PRINT ,E(T)
130 NEXT T
```

CHALLENGE

Create a program that will allow you to INPUT numbers. Have it display all numbers in the left column unless the number ends in 5 or zero. Then have it displayed in the second column.

INFORMATION

Equations are easy to solve using the computer. For example, an object which starts moving at a constant acceleration moves a certain distance during a given time. The equation looks like this:

$$\text{DISTANCE} = \tfrac{1}{2} \times \text{ACCELERATION} \times \text{TIME}^2$$

If the object is falling freely near the surface of the earth, the acceleration is 32.2 ft/sec^2 or 9.8 meters/sec^2.

ENTER/RUN/OBSERVE

```
30 PRINT "TIME","DISTANCE",
"ACCELERATION"
60 A=32.2
70 FOR T=1 TO 10
80 D=(1/2)*A*T*T
90 PRINT T,D,A
100 NEXT T
105 END
```

If your computer does not allow three columns with a comma, use the semicolon.

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CHANGE IT/RUN/OBSERVE

Add a line at 4 and 25 that will clear the screen, then add this line.

```
 5Ø PRINT "(SEC)","(FEET)","(FEET/SEC/SEC)"
```

CHANGE IT/RUN/OBSERVE

If you wish to select between metric units and English units, add these lines.

```
  5 PRINT "WHICH WOULD YOU LIKE, METRIC OR
  ENGLISH UNITS?"
 1Ø PRINT "      (ENTER M OR E)"
 2Ø INPUT A$
 4Ø IF A$="M" GOTO 2ØØ
11Ø GOTO 5Ø
2ØØ A=9.8
21Ø PRINT "(SEC)","(METERS)","(METERS/SEC/
SEC)"
22Ø GOTO 7Ø
```

For Atari, add:

```
  4 DIM A$(5)
```

CHALLENGE

Change the program so that you can determine the distance for every tenth of a second from zero to one second.

SAVE THIS PROGRAM. Name it DISTANCE.

If you have a printer, print out a table of the results.

INFORMATION

If the object was already moving at a speed (SO = speed original), the distance equation becomes:

DISTANCE = (SO x T)+(½ x A x T x T)

Notice that the last part of the equation is the same as you used in your DISTANCE program.

ENTER/RUN/OBSERVE

Load your DISTANCE program, and make these changes.

```
22 PRINT "ENTER THE ORIGINAL SPEED"
24 INPUT SO
8Ø D=(SO*T)+(.5*A*T*T)
```

CHALLENGE

Make the necessary changes in this program to provide for a speed column. SAVE this program. Name it D2.

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INFORMATION

Another useful equation that allows you to determine how fast a falling object is traveling is:

SPEED = SO + (A x T)

where SO = original speed
A = acceleration
T = time

ENTER/RUN/OBSERVE

Load your D2 program and add these lines.

```
85 S=SO+(A*T)
90 PRINT T,D,A,S
```

CHALLENGE

Make the necessary changes so your computer will display four labeled columns of Time, Distance, Acceleration and Speed.

STOP!

If you have finished all the YELLOW projects, pat yourself on the back. You've done an excellent job!

NOW!

Before starting on the GREEN projects, you'll need to learn some new commands from Volume 4 of TLC FOR GROWING MINDS. When you have finished that volume, come back and sharpen your skills with the GREEN projects.

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ENTER/RUN/OBSERVE

Enter, but do not RUN yet.

```
20 REM *** A ONE QUESTION QUIZ ***
30 PRINT
40 PRINT "IN MILLIONS OF DOLLARS, WHAT WAS
THE NATIONAL DEBT IN 1930?"
50 PRINT "      (1) 16,185"
60 PRINT "      (2)     130"
70 PRINT "      (3) 101,723"
80 PRINT "      (4) THERE WAS NO DEBT"
90 PRINT
100 PRINT "ENTER THE NUMBER THAT BEST ANSWERS
THE QUESTION."
110 INPUT N
120 ON N GOTO 1000,2000,3000,4000
130 PRINT "PLEASE SELECT ONE OF THE FOUR
NUMBERS!"
140 GOTO 100
```

Add the command to clear your screen at line 10.

CHANGE IT/RUN/OBSERVE

Now let's add the answers.

```
1000 PRINT "EXCELLENT, THAT IS CORRECT!"
1020 GOTO 5000
2000 PRINT " SORRY, MUCH TOO SMALL!"
```

(program continued)

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```
2020 GOTO 5000
3000 PRINT "SORRY, MUCH TOO LARGE!"
3020 GOTO 5000
4000 PRINT "AH! WISHFUL THINKING!"
4020 GOTO 5000
5000 END
```

RUN several times.

CHANGE IT/RUN/OBSERVE

To repeat the question, add these lines.

```
5000 FOR T=1 TO 1000
5010 NEXT T
5020 PRINT "IT'S NOW THE NEXT PERSON'S TURN."
5030 PRINT "ENTER Q FOR THE QUESTION TO
APPEAR."
5040 INPUT A$
5050 IF A$="Q" GOTO 10
```

Atari will need a DIM A$(1) statement.

RUN and notice that the second time you enter an answer, it doesn't wait for you to press Q.

To correct that, add this line.

```
 25 A$=""
```

CHANGE IT/RUN/OBSERVE

To allow a way out of the program, add these lines.

```
5060 IF A$="XXX" GOTO 6000
5080 GOTO 5030
6000 END
```

CHANGE IT/RUN/OBSERVE

If you wish to record how often each answer is selected, add these lines.

```
1010 A=A+1
2010 B=B+1
3010 C=C+1
4010 D=D+1
6000 PRINT "(1)=";A
6010 PRINT "(2)=";B
6020 PRINT "(3)=";C
6030 PRINT "(4)=";D
6040 END
```

CHALLENGE

Create a two question quiz with all of the features of the above quiz.

SPECIAL CHALLENGE

If you wish, prepare a five question quiz.

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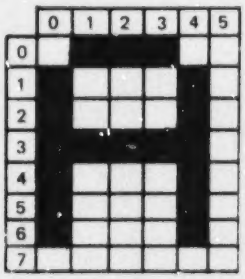
INFORMATION

Before microcomputers were developed, light bulbs were used to display words and numbers. If the bulbs were placed in seven rows of five bulbs per row, it was found that all the numbers from zero to nine and the letters from A to Z could be displayed. Notice the letter A shown below.



CHALLENGE

Starting with line number 1ØØØ, create a program that will display a large A in the center of your screen. Let your last command be RETURN.

Starting with line number 2ØØØ, create a B. Let your last command be RETURN.

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Starting with line number 3000, create a C.

Let your last command be RETURN.

Save this program. Call it ABC.

LOAD the ABC program from the previous project and add these lines.

```
 1Ø FOR T=1 TO 1ØØØ
 2Ø NEXT T
 3Ø GOTO 4Ø
 35 PRINT "I'M NOT READY FOR THAT LETTER YET!"
 4Ø PRINT "ENTER A, B OR C"
 5Ø INPUT A$
 6Ø IF A$="A" THEN N=1
 7Ø IF A$="B" THEN N=2
 8Ø IF A$="C" THEN N=3
 85 IF N=Ø GOTO 35
 9Ø ON N GOSUB 1ØØØ,2ØØØ,3ØØØ
 92 N=Ø
 95 GOTO 4Ø
```

At line 25, place the command to clear the screen.

CHANGE IT/RUN/OBSERVE

If your computer understands INKEY$, use it instead of A$.

CHALLENGE

Can you change your program to allow the letters T, R and E to also be displayed?

SAVE this program. Call it ABCTRE.

SPECIAL CHALLENGE

Complete the alphabet! Create a program that a small child can use to see large letters of the alphabet displayed.

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INFORMATION

With the commands you now know, you can create words composed of randomly selected letters. You can also tally how often each letter is selected.

ENTER/RUN/OBSERVE

```
 5 FOR T=Ø TO 49
1Ø FOR X=Ø TO 3
2Ø N=65+INT(25*RND(Ø))
3Ø PRINT CHR$(N);
4Ø NEXT X
45 PRINT,
5Ø NEXT T
```

Run several times.

CHANGE IT/RUN/OBSERVE

Now add these lines.

```
 35 GOSUB 1ØØ
 55 PRINT
 9Ø PRINT A,B
1ØØ END
```

(program continued)

```
110 IF N=65 THEN A=A+1
120 IF N=66 THEN B=B+1
140 RETURN
```

SAVE this program. Call it LC for Letter Count.

CHALLENGE

Add to this program so that it will count and display the letters from A to H.

INFORMATION

You may also store the letters in an array as they are randomly selected and counted later.

ENTER/RUN/OBSERVE

LOAD the program named LC and add these lines.

```
  4 DIM L(200)
  5 FOR T=0 TO 196 STEP 4
 35 L(T+X)=N
 90 FOR L=0 TO 25
100 FOR T=0 TO 200
110 IF L(T)=65+L THEN A=A+1
120 NEXT T
140 PRINT CHR$(65+L);" = ";A,
150 NEXT L
```

CHANGE IT/RUN/OBSERVE

As a check, you can sum the letter counts and get a total.

```
145 S=S+A
160 PRINT
170 PRINT "SUM = ";S
```

Notice that the sum is too large! You need to set A equal to zero each time. Add this line.

```
146 A=0
```

SAVE this program. Name it LC2.

CHALLENGE

Change this program so that it will print out one hundred three-letter words in four columns on a printer. Print the letter count and sum also. Notice how few form real words.

SPECIAL CHALLENGE

Print out 1000 words. Were the letters selected equally? How many English words were randomly printed? How many words can you identify from another language? Show your list to others for help.

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ENTER/RUN/OBSERVE

Atari will need 15 DIM X$(1).

```
 1Ø DIM L$(25)
 2Ø DATA A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,
Q,R,S,T,U,V,W,X,Y,Z
 5Ø REM ** READ THE DATA INTO THE ARRAY **
 6Ø FOR A=Ø TO 25
 7Ø READ X$
 8Ø L$(A)=X$
 9Ø NEXT A
1ØØ REM ** RANDOMLY SELECT 3 LETTERS **
11Ø FOR N=Ø TO 2
12Ø X=INT(RND(Ø)*26)
13Ø PRINT L$(X);
14Ø NEXT N
15Ø PRINT,
2ØØ REM ** SELECT THE NUMBER OF WORDS **
2Ø5 T=T+1
21Ø IF T=5Ø GOTO 5ØØ
23Ø GOTO 1ØØ
5ØØ END
```

Make any changes necessary for this to RUN on your computer.

CHANGE IT/RUN/OBSERVE

```
 3Ø PRINT "HOW MANY WORDS DO YOU WANT?"
 4Ø INPUT Z
21Ø IF T=Z-1 GOTO 5ØØ
```

Notice how few produce words in the English language.

CHALLENGE

Using a printer, print out 5ØØ words in five columns.

INFORMATION

Not all letters appear with equal frequency in the English language. The DATA in this program reflects the relative usage.

ENTER/RUN/OBSERVE

```
  5Ø DIM L$(284)
  6Ø INPUT "HOW MANY WORDS?";Z
 1ØØ FOR L=Ø TO 283
 11Ø READ L$(L)
 12Ø NEXT L
 19Ø FOR W=1 TO Z
 2ØØ FOR N=Ø TO 2
 21Ø X=INT(RND(Ø)*284)
 22Ø PRINT L$(X);
 23Ø NEXT N
 24Ø PRINT,
 25Ø NEXT W
1ØØØ DATA E,E,E,E,E,E,E,E,E,E,E,E,E,E,E,E,
E,E,E,E,E,E,E,E,E,E,E,E,E,E,E,E
1Ø1Ø DATA O,O,O,O,O,O,O,O,O,O,O,O,O,O,O,O,
O,O,O,O,O,O,O,O,O,O
1Ø2Ø DATA T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,
T,T,T,T,T,T,T,T,T
1Ø3Ø DATA A,A,A,A,A,A,A,A,A,A,A,A,A,A,A,A,
A,A,A,A
```

(program continued)

```
1040 DATA S,S,S,S,S,S,S,S,S,S,S,S,S,S,S,S,S,S,S
1050 DATA H,H,H,H,H,H,H,H,H,H,H,H,H,H,H,H,H,H,H
1060 DATA N,N,N,N,N,N,N,N,N,N,N,N,N,N,N,N,N,N,N
1070 DATA I,I,I,I,I,I,I,I,I,I,I,I,I,I,I,I,I,I,I
1080 DATA R,R,R,R,R,R,R,R,R,R,R,R,R,R,R,R,R,R,R
1090 DATA L,L,L,L,L,L,L,L,L,L,L,L
1100 DATA D,D,D,D,D,D,D,D,D,D,D,D
1110 DATA U,U,U,U,U,U,U,U,U,U
1120 DATA M,M,M,M,M,M,M,M,M
1130 DATA Y,Y,Y,Y,Y,Y,Y,Y
1140 DATA W,W,W,W,W,W,W
1150 DATA F,F,F,F,F,F
1160 DATA C,C,C,C,C,C
1170 DATA G,G,G,G,G
1180 DATA P,P,P,P
1190 DATA B,B,B,B
1200 DATA V,V,V
1210 DATA K,K,K
1220 DATA J,Q,X,Z
```

SAVE this program. Name it DATA2.

CHALLENGE

Change the above program so that it will count how often each letter is selected in 1000 three-letter words.

SUPER CHALLENGE

Create a program that will allow you to INPUT many sentences. Have your program keep count of how often each letter is used. Also keep count of spaces, periods, commas and question marks.

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